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Claims



1. Liquid filtering apparatus in the form of an open or closed vessel containing deep, static beds of coarse granular material such as sand acting as filter medium supported on a porous floor that divides the vessel into an upper turbid liquid chamber with an inlet nozzle or connection and an upper outlet or connection for the removal of bed back-washing liquid and a lower filtrate chamber with a back-washing liquid inlet nozzle and a filtrate outlet nozzle, whereby an operation to remove suspended solids the turbid liquid is preferably passed from top to bottom through the bed after which, and before repeating the cycle, clean liquid such as filtrate is passed through the bed from bottom to top to remove the solids trapped in the bed which leave the container as a suspension through a top outlet nozzle or connection, whereby the container (1) with an upper turbid liquid feed conduit (12) and a lower filtrate outlet conduit (16) is divided in the vicinity of the pervious horizontal base (2) in such a way that a dependent rim portion(s) (3) of the upper turbid liquid chamber (5) is movable to facilitate the discharge of the bed from the container.

2. Liquid filtering apparatus according to Claim 1, whereby means are provided to discharge the bed to a bed regeneration device (6), where the bed material is cleaned or cleaned and reactivated and recycled to the turbid liquid chamber (5) of the filtering apparatus (1) for reuse.

3. A liquid purification system according to Claim 2, whereby means are provided for dosing the cleaned and regenerated grains to the said turbid liquid chamber or to the feed of liquid to be purified during the purification operation.

4. A liquid purification apparatus according to Claim 3, whereby means are provided to dose pre-mixed or separately dose cleaned and regenerated grains of the bed with the powdered adsorbent materials to the said contaminant filter chamber or the feed of liquid to be purified during the purification process.

5. Liquid filtering apparatus according to Claim 3 or Claim 4, whereby means are provided in the form of a conically perforated distributor (27) that extends over the entire internal cross-section of the turbid liquid chamber (5).

6. In a travelling web, flat bed filter apparatus that functions intermittently and in the stationary, sealed position receives contaminated liquid in a horizontal upper chamber and delivers filtered liquid from a lower filtrate chamber having a section of filter web or medium lying on and supported by a horizontal, fixed, pervious support plate or fixed drainage plate; cover means with dependent rim sections extending downwards, the lower surfaces of which make direct sealing engagement with peripheral portions of

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said section of filter medium or web, thus forming an upper contaminant chamber; a receptacle for filtered liquid located beneath the support plate having upstanding rim portions or a drainage plate with extended rim portions, whereby the upper surfaces of said rim portions make sealing engagement with the lower peripheral portions of the section of the filter medium or web, thus forming a lower filtrate chamber or drainage space; means for engaging and disengaging the said sealing surfaces of the upper cover and lower receptacle or recess, thus sealing and releasing respectively the said portions of the filter web; either a pressure pump located in a conduit in fluid connection with the means of contaminant supply and the interior of the upper contaminant chamber, combined with a liquid pressure pump the inlet of which is in liquid communication with the interior of the said receptacle for filtered liquid; or a suction/vacuum pump located directly in a conduit in fluid connection with the interior of the lower filtrate chamber or drainage space or indirectly through a filtrate receiver with a conduit in fluid communication with the interior of the lower filtrate chamber or drainage space; each of said pump configurations providing the means for transporting both contaminated and filtered liquid thereby creating and maintaining a pressure difference between the contaminant and filtrate chambers or drainage space; conduit means in fluid communication with a source of compressed gas and/or the surrounding atmosphere and the interior of the upper contaminant chamber; means for controlling the filtration operation consisting of liquid level and pressure switches connected to the filter chambers set to switch at maximum and/or minimum values, whereby said liquid level switches control the means for interrupting and initiating fluid flow in the gas conduits and the pressure switches are employed for interrupting or initiating the flow in the said liquid and gas conduits; transport means in engagement with the filter web to transport it over the said support plate consisting of a belt conveyor connected on both sides with chain and drive sprockets, whereby sections of the band are used as support for discrete strips of prefabricated filter media from storage means pre-cut to appropriate length and then introduced to the interior of the turbid liquid chamber (5) to coincide with the pervious horizontal base (2) and sealed at the periphery by the dependent rim portion(s) (3) of the said chamber.

7. Liquid purifying apparatus according to Claim 3 or Claim 4, whereby the dosing devices are controlled by a microprocessor (15) from input signals from feed and filtrate instrumentation (13,14).

8. In a travelling web, flat bed filter apparatus that functions intermittently and in the stationary, sealed position receives contaminated liquid in a horizontal upper chamber and delivers filtered liquid from a lower filtrate chamber having a section of filter web or medium lying on and supported by a horizontal, fixed, pervious support plate or fixed drainage plate; cover means with dependent rim sections extending downwards, the lower surfaces of which make direct sealing engagement with peripheral portions of

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said section of filter medium or web, thus forming an upper contaminant chamber; a receptacle for filtered liquid located beneath the support plate having upstanding rim portions or a drainage plate with extended rim portions, whereby the upper surfaces of said rim portions make sealing engagement with the lower peripheral portions of the section of the filter medium or web, thus forming a lower filtrate chamber or drainage space; means for engaging and disengaging the said sealing surfaces of the upper cover and lower receptacle or recess, thus sealing and releasing respectively the said portions of the filter web; either a pressure pump located in a conduit in fluid connection with the means of contaminant supply and the interior of the upper contaminant chamber, combined with a liquid pressure pump the inlet of which is in liquid communication with the interior of the said receptacle for filtered liquid; or a suction/vacuum pump located directly in a conduit in fluid connection with the interior of the lower filtrate chamber or drainage space or indirectly through a filtrate receiver with a conduit in fluid communication with the interior of the lower filtrate chamber or drainage space; each of said pump configurations providing the means for transporting both contaminated and filtered liquid thereby creating and maintaining a pressure difference between the contaminant and filtrate chambers or drainage space; conduit means in fluid communication with a source of compressed gas and/or the surrounding atmosphere and the interior of the upper contaminant chamber; means for controlling the filtration operation consisting of liquid level and pressure switches connected to the filter chambers set to switch at maximum and/or minimum values, whereby said liquid level switches control the means for interrupting and initiating fluid flow in the gas conduits and the pressure switches are employed for interrupting or initiating the flow in the said liquid and gas conduits; transport means in engagement with the filter web to transport it over the said support plate consisting of a belt conveyor connected on both sides with chain and drive sprockets, whereby the improvement comprises means for determining and/or controlling the rate of filtration of a quantity of liquid contained in the contaminant chamber comprising a gas flow meter (406), gas throttling valve (407) and gas pressure meter (405) in the said conduit in fluid communication with a source of compressed gas and the interior of the upper contaminant chamber.

9. Method of liquid purification control according to Claim 6 or 8, whereby in conjunction with the determination of the quality of the turbid liquid and filtrate by the means (13, 14), single sheets of known filtration characteristics are employed for determining the filtration characteristics of turbid liquids of unknown filtration characteristics, whereby the sheets after these determinations are transported out of the filter chamber for deposition or whereby sections of the filter band of unknown filtration characteristics are transported onto the said pervious support plate or fixed drainage plate for determining the filtration characteristics with liquids of known filtration characteristics.